Draft Notes from CCFFFP Workshop 9/2-9/3 1999

Attendees

George Heise - DFG	X	X
Sean Rose - EBMUD	X	X
Serge Birk - CVPWA	X	X
Dennis Dorratcague - Montgomery Watson	X	X
Steve Roberts - DWR-USWP Planning	X	X
Charles Liston - USBR	X	X
Ron Brockman - USBR	X	
Darryl Hayes - DWR	X	X
Rick Wantuck - NMFS	X	X
Victor Pacheco - DWR-O&M	X	
Dan Odenweller - DFG	X	X
Jim Buell - Buell & Assoc.	X	X
Ron Bachman - USFWS	X	
Randy Beckwith - DWR-ESO	X	X
Terry Erlewine - SWC	X	X
Roger Padilla - DWR	X	X
Tara Smith - DWR	X	
Marianne Kirkland - DWR	X	
Michele Ng - DWR	X	X
Dave Forkel - Delta Wetlands	X	
John Winther - Delta Wetlands	X	
Ron Lee - DWR	X	X
Frank Bottaro - DWR	X	X
Tom Cannon - Foster Wheeler Environmental	X	X
Ted Frink - DWR-Delta Fisheries Section	X	
Tina Swanson - UC Davis, TBI	X	X
Cincin Young - UC Davis	X	X
Shawn Mayr - DWR-DOE	X	X
Paul Fujitani - USBR	X	X
Matt Vandenberg - USFWS	X	
Ryan Olah - USFWS	X	X
Paul Hanna - USFWS	X	
Justin Ly - USFWS	X	
Rick Christensen - USBR	X	X
Ken Bates - Oregon Fish and Wildlife	X	X
Rock Oltmann - USGS	X	
Bob Fujimura - DFG	X	X
Ned Taft - Alden Research Labs	X	X
Jim Snow - Westlands Water District	X	X
Jim Spense - DWR	X	
John Andrew - DWR-ESO	X	X
Gordon Enas - DWR-Engineering	X	
Stein Buer - CALFED	X	
Ron Ott - CALFED	X	X

Workshop Purpose

The intent of the CCFFF Project is to use the best available technology developed from the Tracy Fish Test Facility to implement an incremental modular approach to achieve the goal of screening the full capacity of the SWP. The first module will consist of 2,500 cfs fish screens with the capability of adding modules to the full SWP capacity of 10,300 cfs. If the future decision is made for one point of diversion at the CCF site for the SWP and CVP, modules would be added to screen the full combined capacity of the CVP and SWP.

The purpose of this workshop was to start the process of the design concepts for CCFFF project alternatives and foster an integrated approach to new fish facilities in the Delta.

Workshop Summary

Highlights Day 1

- Concepts for 500 cfs Tracy Fish Testing Facility and 2500 cfs Clifton Court Forebay module were described.
- Organization of CFFTAT (CTAT) and TTAT described, along with CVFF Review Team and CVFF Coordination Team as part of new CALFED South Delta Program.
- New intake location identified north of CCF on Byron Tract.
- Multiple intake option brought up (including Delta island storage intakes linked to CCF).
- Option of no-bypass screen system brought up as alternative to bypass system with fish handling and trucking – does it simply shift the killing field.
- Cost effectiveness of working on both programs together.
- Information on Delta hydrodynamics – effects of pumping, tides, wind, inflow, barometric pressure, barriers
- Role of barriers in maintaining water levels – constraints to pumping due to water level limitations.
- Importance of CMARP for obtaining information and monitoring.
- Screening criteria – screen approach and sweeping velocities
- Importance of intake location
- Need to test gravity and pump fish facilities
- Need to test pumping before and after screens.
- Reviewed factors relating to SWP pumping operations in South Delta.
- Factors involved in pumping schedule at new intake – cost of pumping, water levels, fish screening,
- Concern that we were straying too far from charge of defining design criteria for new CCFFF module.
- Concern that we were considering a fatally flawed concept – one with a fish bypass with handling and trucking.
- Importance of taking focused issues to management.

Highlights Day 2

- Developed a components matrix for fish bypass facilities that included trashrack, fish screen, bypass, fish lift, separator, holding, transport, and release components.
- A "radical idea" was presented for CCF intake system – don't build an expensive new screen system.
- The "PC" concept/issue will not die.

- Davis treadmill studies show much promise and preliminary insights. Early results indicate splittail are tough and delta smelt are weak and sensitive; and sweeping velocities and 0.2 fps approach velocity are good.
- Identifying things to test at Tracy TFTF that would help with design of CCFFF.

Major Issues/Concerns

- Cumulative survival through all bypass system components.
- Whether or not to handle/bypass fish or leave them in Delta – exposure time criteria – and the "killing field".
- Options available for intake – location and number.
- How to meet goals for delta smelt with any bypass component.
- Debris (and mitten crab) problem.
- Predator management in bypass system. *Separating the large from the small, and the small from the very small.*
- Too many components and combinations of components – need for side studies to weed some things out.
- Meeting schedule of 2500 cfs module – including TFTF testing results.

Agreements

- DEFT should take on "need-for-bypass" issue.
- CTAT and TTAT should work together to design bypass system.
- Agreed to define assumptions and constraints, and limitations.
- Agreed to define what we have to protect.
- Agreed to make assumptions and communicate them to our management.
- Agreed to define our mandate and potential for success.
- Agreed to draw more on experiences from GCID, Red Bluff, White River, Yakima, and others.
- Need a Plan for developing 2500 CCFFF module – CTAT should get to work on the plan.

DAY 1 – Basic Design Criteria

Introduction - Why we are here

Overall Goal

Develop and Implement New Fish Collection, Holding, Transport, and Release Technology That Will Significantly Improve Fish Protection at Major Water Diversions in the South Delta.

- Delta Fish Facilities team advised CALFED on the CALFED alternative. This evolved into DEFT and now into South Delta Diversion aspect of the South Delta Program of CALFED. SD Program includes diversions, barriers, habitat, screening facilities - 500 cfs Tracy Test Facility (CVP) and first module of 2500 cfs for Clifton Court (SWP). SD bundle include 2 dozen groups of actions and 100's of individual actions.
- SD Agreement was a consensus-based process with integrated CCF and Tracy approach.
- Develop early conceptual design for CCFFF module, that will eventually lead to 10.3 kcfs facility at CCF.
- A key decision point will be whether to combine the two project intakes at CCF and/or to expand the TFF to 4600 cfs.
- Locations at north end of CCF.
- TTAT + CCFTAT feed issues to CVFF Review Team, which feeds issues to CVFF Coord Team, which reports SD Program. (see diagram)
- Advantages of a north site: sweeping flow, channel location (no channel islands as in existing location), safety, no need to dredge, etc.

Q: Are we evaluating need to screen to 15 kcfs? R: That is an option and is why we have chosen the 2500-cfs module. We can add a module at a time consistent with Adaptive Management objectives of CALFED. Evaluation would be conducted through monitoring and CMARP.

Q: What about the option to connect to Delta island intakes? R: This is still under consideration by the Integrated Storage Program. Regardless we would likely still have an intake location near CCF. Byron, Bacon, and other islands are being considered.
Q: Is there a difference in cost for two fish facilities? Two will cost 750 million. Difference would be about $30 million.

Purpose/Role of Workshop -- Workshop Objectives

- *Blank slate for design*
- To obtain direction for planning and design staffs working on CCFFF.
- Review hydrology in area of intakes and its effects on design and operations.
- Role/effect on water levels – option big gulp to protect low tide stages in south Delta.
- What do we know and what further studies are needed?
- What are key issues?

Objectives

- **Minimize debris effects**
- **Improve bypass efficiency**
- **Evaluate fish friendly lifts**
- **Develop new concepts for holding chambers**
- **Develop new methods for fish transportation and release**
- **Develop a system with long-term mechanical reliability**
- **Expand new and proven technology to full scale fish facilities**

C: Concerned about intake location because of cost.
C: Concerned about the size of modules.
C: Concerned about the full 15 kcfs capability later.
C: Concerned about *Italian Slough being built.*
C: Staging of design evaluation will help.
C: Handling mortality of delta smelt will be key design factor.
C: Concerned about downstream water surface effect from pumping at north site on CCF.
C: Concerned about whether the potential benefits of new FF are real.
C: Concerned about staffing because DWR is downsizing.
Q: Are water needs of users in future unknown? R: To some extent yes.
C: Concern about the overall schedule – Tracy overlap with CCF studies.
Q: Where is CMARP process – concern about CMARP being in neutral without funding. Who will drive process and information collection? R: the team will take questions to CMARP. CMARP will have a role in obtaining the information we need.

Basic Design Criteria

- NMFS, DFG, FWS have screen design criteria and have an interest in defining criteria for the CCFFF.
- Differences occur among the different criteria because they have different purposes.
- NMFS criteria are more restrictive for salmon and take precedence over DFG criteria.
- Conflicts exist between the steelhead and delta smelt criteria. New Davis treadmill studies will help to solve some of these conflicts.
- Delta smelt criteria is 0.2 fps approach velocity – if no smelt at risk, then criteria defaults to 0.33 fps.
- The northwest intake location has an additional design advantage in that it has potential sweeping velocities across the screen at that location, rather than the dead end channel as at TFF. There are no sweeping velocity criteria.

NMFS Criteria:
California specific criteria have been developed via authorities under ESA, FPA, FWQA; allow for site specific options/variances granted by NMFS engineering dept given effective rationale; NMFS may require studies to collect information. All factors must be thoroughly evaluated. Supporting documents: fish guidance devices, and juvenile fish screen criteria for pump intakes.

- Four stage design process: preliminary, feasibility, final design, formal acceptance
- Criteria are more than just velocity – other factors should be included.
- Three categories of locations: lakes, canals, rivers
- *Basic principle is not to handle fish – leave them in natural environment*
- NMFS salmon fry criteria: streams and lakes = 0.33 fps approach velocity; 0.4 in canals
- Fingerling criteria – defer to more stringent DFG criteria
- Need for uniform flow distribution – baffles.
- Sweeping velocity = DFG criteria of 2X the approach velocity – learn from treadmill experience

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- Screen types: profile bar and perforated plate.
- Structural features: screens flush with banks and no eddies.
- Provisions for bypass systems – exposure time important – details dictated by project features including bypass entrances, bypass outflow, operations and maintenance
- Recent studies provide valuable insights (e.g., RD 1004 study)
- Cooperative relationship when it comes to other criteria (e.g., delta smelt)
- NMFS team takes a multi-species approach. Reviews all research when it comes to screens.
- CCF challenges – concern about active bypass and handling of fish – transport mortality – cost of fish handling facilities.
- Concerned about one large central 15 kcfs diversion – should consider multiple intake array options with dispersed locations – local influence would be less overall – could use screens that don't require bypass – lessen effect on Delta hydrodynamics – better mix and match for fish distribution and water quality – less problems with debris.
- CALFED's version of an isolated facility was reasonable
- Future: need assurances, better measures of water use; merits of taking some water from North Delta.; better communications and public outreach.

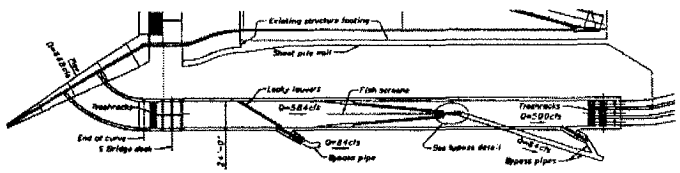
C: CALFED chose the least preferred of the alternatives

Tracy Fish Test Facility Project (TFTFP)

- Tracy is a sump – predator problems for fish in dead end.
- Many problems: debris, ineffective salvage with louver system
- Not meeting objectives
- Fish Facilities Improvement Program (FFIP)
- Many species to worry about

TFTF Themes

- Debris handling
- Fish friendly lifts
- Fish transport & release systems
- Fish separating systems



MAIN CHANNEL FLOW
LOW TIDE

- South Delta challenges: tides 3-5 ft; debris (Egeria); predators (striped bass) in front and behind louvers; mitten crabs.
- The test facility would be a cousin to the one at Red Bluff.
- Testing: gravity and lift bypasses; transport and release experiments; mechanical reliability
- Consensus to date: 23 areas of agreement
- Conceptual design is next.
- Design features: velocity criteria, predation, trash/debris, fish sorting, O&M, constructability, cost, future considerations.
- 500 cfs diversion = 628 cfs at intake because of bypass and other needs

Design Considerations

- Agency screen criteria
- Predation
- Holding requirements
- Transport requirements
- Fish sorting by size
- O&M
- Constructability
- Costs
- Future additions

Q: Which has more flexibility to handle a variety of fish – gravity or pump systems? R: Need to test gravity systems, which we will be set up to do at the TFTF. Will have to handle more debris in one than the other.
Q: Why test both types if Red Bluff has already? R: fish are all different – do not have data on smelt. At Red Bluff we have had good luck with the lift pumps so far. Archimedes pump is more cumbersome - some value in testing – positive option on ability to move fish.

Q: Will you consider a third pump type? R: Yes.
C: You could let velocity float with continuous pumping over the tide.
Q: Could we also consider a no-bypass system with exclusion screen. R: There are no sweeping flows in the SD at the TFF.
C: Need flexibility to test other things – separating and loading facilities.
C: We have a through-system design.
Q: Do we have room for a pre-screen crab separator? R: A guidance system for keeping crabs out is now being tested.

CCF-SWP Operations

- Delta demands are met with Keswick releases (5 days delay) and Oroville releases (3 day delay) – thus some forecasting of demands is necessary to plan releases.
- Demands from Oroville include flood control releases, instream flow requirements, hatchery needs, and Delta demands.
- Pumping restricted by ability to open gates and pull in water at CCF while maintain SD water levels adequate for Delta diverters.
- Head difference at gates of CCF is 3ft.
- Storage capacity of CCF is 2200 AF
- Filling capacity of 12 kcfs if not pumping, otherwise higher if pumping.
- Plan monthly export around the tide forecast, then overlay with priority to determine export potential.
- Dynamic system especially if we are pumping at the same time we are filling CCF. Juggling act.
- Pumping usually at night at off-peak electric rates. This year however it has been dead flat at capacity + extra 500 cfs allowed to help refill San Luis. Changing normal schedule costs big dollars.
- Changes at CCF also affect upstream operations (releases). The ball of yarn we are playing with is sometimes bigger than we think it is.
- Pumping automatically trips off when water level falls to ~3 or ~4 ft msl; also affected by wind conditions.

Q: What determines priority? R: Degree of complaints. When barriers are in operation there are no problems. Opening gates also depends on demands. We stay away from the low-low and high-high for filling CCF.
Q: What is the head difference at the gates of CCF? R: 3 ft.
Q: Would this be operational scheme with a new facility? R: Operation would change. May not be able to take water at LL. There are other physical problems that limit diversion in the SD. Priority system is 20 years old and is designed to minimize complaints.
Q: Does water level in SD affect louver operation? R: Yes because of need to maintain criteria. Weed build up also affected by water level.
Q: How are gate openings determined? R: Field guys work CCF usually open or closed, but gain throttle gates if needed. They usually try to fill as quickly as possible. But do adjust gate opening as a function of tide and head.
Q: Is inflow limit 12,000 cfs because of scour protection? R: CCF is also filling with sediment.
Q: Are fish more susceptible to salvage at night? R: Yes.

South Delta Hydrodynamics

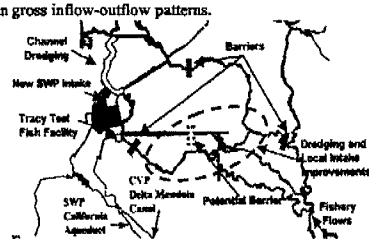
- Network of tidal flow UVM meters including Old and Middle rivers since 1987. Data soon on IEP webpage.
- Ultrasonic velocity meters as well in combination with surface Doppler measurements.
- UVM's are expensive. Now using more vertical velocity meters since 1997 to measure x-sec velocity.
- Testing side beam transducers in conjunction with SD ag barrier study. DWR is also installing more of these.
- In 1997 with high export patterns net velocities in SD were toward the pumps. In 1998 there was net downstream toward the Bay velocity.
- Tides (spring high/neap low) also have a big affect on velocities and water level
- Pumping effects different if Delta is draining or filling.
- Winds and air pressure also affect hydrodynamics associated with pumping.

- 1997 VAMP where exports went from 8kcfs to 2kcfs and back to 8 kcfs had little effect on water level. We only filtered out a $4/10^{ths}$-ft effect in SD. Twenty miles to the north at Dutch Slough we only saw a 0.1-ft effect from pumping less.
- Only a real high SJ flow gives a net downstream flow when pumping (like 1998).

Q: How much of the net flow difference is a function of CCF pumping? R: Do not know. There is 150 kcfs tidal flow versus net 10 kcfs effect of pumps. Heavy exports in 1989 had large net flow effect on Delta hydrodynamics.
Q: Have you looked at other factors? R: Haven't looked at all factors or combinations of factors.
C: Differences in salvage at the two facilities are likely a function of the diverse hydrology in SD. For example the Tracy takes mostly SJ water at times. Barrier operations further complicate and change dynamics.
S: We should overlay salvage data on these observed patterns over the past few years.
C: These data argue against high Banks pumping – better to have different combination of intake options.
C: Fish are likely more responsive to the velocity field than gross inflow-outflow patterns.

Delta Modeling of New Intake Locations

- Modeling part of SD Program
- New intake location north of CCF on Byron Tract.
- Scouring would not be a problem at new location.
- New location avoids need to dredge around channel islands near present intake location to CCF.



Flat lining pumping would be less of a scour problem. New intake could accommodate flat lining pumping.Flat out 6680 cfs pumping would not affect SD water levels. Problem with stages still with LL pumping if gulping – would require more dredging to resolve.

- Two options for filling meeting CCF pump demands – gulping or flat lining.
- Concerns: head loss through louvers; ability to draw CCF down; affect on Delta hydrodynamics and water levels. Solution would appear to be avoiding pumping at LL tides – about 2-3 hours per day – but only need such restrictions seasonally.
- More modeling – Draft EIR early 2000.
- Changes to Banks operations affect operations elsewhere – electric system demands – operations of Oroville hydroproject.

Q: Why drop the Grant Line canal barrier? R: not needed to maintain water levels and problems with rec boating. May also increase smelt movement to SD. Water levels will be fine leaving question about smelt.
C: Pumping was constant in early years of SWP. Then started pumping off peak. (Implying that this change may be part of the Delta problem.) Hood intake would help alleviate "problem".
C: We should consider variable speed drives to match tides.
C: The first 2500-cfs module should have optimally flexible design.
C: Feedback from hydrologic modelers and screen designers desirable.
S: How about head pumps behind screens for LL tides. R: Yes, but mech problem turning pumps on and off.
Q: Has power deregulation affected operations? R: Yes, steady flows would be less of a problem.
S: Low-head lift pump could be employed in off peak hours without fish damage. Pumping at high water level would be cheaper during off peak. Low head pumping around the clock and high head sporadic. Reduced head for big pumps by keeping forebay full using low-head pumps. We could also build our screening facilities at more efficient high water levels. This would enable full pumping during off peak power.
C: It would have to pay for itself, otherwise not worth it – cost of such a system would be high.
C: Design may involve screen before or after pumps. It was cheaper to build screens in past than to pump – that has changed.
C: The system would provide fish friendly pumping into CCF and greater capacity in CCF, and provide a gravity system for moving fish back.

S: An interdisciplinary group should look into this option.
C: Need to consider effect on SD water levels and barrier operations.
C: Different criteria needed for different seasons. We could avoid over-designing the system.
C: EWA will help by providing additional protections when fish are around pumps.
C: We have to design the overall system for ultimate flexibility.
C: We need to feedback to management with well-informed questions about our ideas.
C: Remember that VAMP is just an experiment.
C: Design issues are more urgent.
C: We need to address unknowns; fits into schedule – near term issues are critical.

Closing Comments for Day 1 of Workshop

C: We should be satisfied with identifying key issues for CCF design.
C: We should understand information needs.
C: We should not constrain our opt ions – is the trap-transport feature a fatal flaw?
C: Our job is to develop design concepts for certain settings – focus on velocity criteria for screens that may change tidally – provide flexibility – get to the details
C: Our task seems to be growing – focus on TFF and first stage CCF. Just the facilities and constraints.
C: Hard to be partner and ESA regulator (NMFS)
C: We should get some quick info on truck and transport, as it may be weak link in overall survival potential of FF.
C: Need more consensus on our charge/scope.
C: Assumptions for what we are doing are not always shared.
C: Concern that handling and trucking may be a "big wrong turn".
C: Need to define conceptual alternatives.
C: Need to focus direction to get out of research mode.
C: We should ID areas of consensus- comfort – plus areas of discomfort/issues/questions.
C: Issues are complex – like pump and dump idea – we should focus more on design details.
C: Need to know all parameters as a designer.
C: It was nice to see how water moves in Delta.
C: Research priority – TTAT needs a major effort to prioritize 65 items and focus on improving transport survival.
C: Mandates vs consensus – everyone has mandates
C: Too much concern over far-field, when job is near-field.
C: The more we can bring to the surface and run up the chain of command the better.
C: Need to have well thought out ideas and concepts to run up the chain. They will make decisions for us.

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DAY 2 – Concept Alternatives

Conceptual Alternatives

- Issues to consider
- Components (pumps, debris) – pieces – each with options
- Non-structural, more global study areas – near and far field effects.
- Road map from here – written criteria (flows and elevations)
- Sub-project work teams – review things like pump and dump concept.
- Screen and location – macroview

Components of the Fish Salvage Process and Their Potential Effect on Fish

(X denotes a significant potential effect)

Component	Debris Problem	Fish Delay or Stress	Predation	Mech Damage	Impinge on screen	Cleaning effects
Trashrack	X	X	X			
Fish Screen		X	X		X	X
Bypass		X	X			
Fish Lift		X		X		
Fish sorting, collection, and counting		X	X	X		
Holding		X	X	X		
Transport		X	X	X		
Release site		X	X	X		

- Goal is to get cumulative survival of 95% or higher for these factors. If there are eight components each with 95% mortality, cumulative survival is only 66%. If each has 99% survival, then cumulative survival is only 92%.

- With present estimates of survival of salmon passage through CCF of only 25% and 0% survival of smelt in trucking, then much need for improvement. These are critical factors to overcome.

- Louver efficiency is also a problem: only 60% for smelt.

- Collection point, holding tanks, and transportation losses are also a problem.

C: Maybe the answer is not developing a new screen system?
C: Maybe the answer is not to handle the fish

Radical Idea:
a) Far-field channel improvements (to improve flow dynamics in south Delta)
b) Near-field
   1) connect CCF through Italian Slough
   2) open CCF gates permanently
   3) operate existing louvers
   4) declare CCF shallow water habitat

Consequence: eliminate predation in CCF and provide 95% efficiency for salmon at louvers.

C: There would still be predation in CCF.
Q: What have we done for recovery? Still feel compelled to deal with entrainment and predation.
C: Relying on other programs like the Environmental Water Account for recovery is asking too much.
C: Shows challenge we face.
C: Prefer to have a mission statement from management.
PC Comes Up Again:

C: Building the PC and Hood intake was not the best mix from the point of view of the DEFT team. R: DEFT really had no coming together of minds, thus not surprised about the miscommunication.
Q: How was decision not to choose the PC alternative made? R: DEIS identified the dual system as preferred. Feedback on DEIS lead to decision to start with the South Delta fix in Stage 1. If it doesn't work, then a dual system may be attempted. DEFT found screens to be an improvement over the existing situation. Every working group can't take on the whole CALFED problem. This workgroup is charged with coming up with the best SD fix in Stage 1. Management understands the risk of failure in the SD. But if we can't save delta smelt, we can't achieve our goal. We all got a similar answer from our management.
S: Suggest we get this in writing from management.

Concept Alternatives

Approaching the SD problem:
S: Work from outside in. Work with the transport problem first because that is the major problem for delta smelt.
C: Each component of the system could be fatal flaw not just transport.
S: Analyze each component, then put them back together.
C: They all get built at the same time, so we should address them as a unit.
C: Experimental design can look at each component and the aggregate.

Component	Approaches			
Debris	Boom, rake, rack	Sloping rack, conveyor	Surge, backflush	Back flow
Fish Screen	Vertical V	Cylinders	Mod inclined screen	
Bypass	Open ramp articulated	Open ramp Second screen	Orifice with lift pumps	
Fish Lift	Low lift pumps Entire flow	Pump bypass	Lock, hopper, truck	Hopper truck
Fish sorting, collection, and counting (separator)	Leaky louver before screen	Mechanical wet separator	Leaky louver after screen, Live box	
Holding				
Transport	Truck	Barge	Train	Direct release
Tide	Vary flow Constant V	Constant flow, var V	Constant Q&V	Float screen, MIS, box screens

S: at monitoring, release, pump, predator management, and sediment handling to component list.

No-Handle Option:
Q: Are we narrowed to the salvage system or can we consider No-Handle Option? R: We can explore within our constraints.
Q: What are our constraints? R: We need to deal with screen location. Can't ignore the fixed screen with no bypass.
C: Given the high predation in CCF, keeping the fish out with a fixed screen would simply move the killing field outside CCF. R: CCF is a confined trap, while the open Delta is not. There may not be a killing field and it may not be necessary to handle the fish.
C: This group should be able to make a determination whether we can do this without bypasses and handling/trucking.

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S: We could build facilities with option to bypass or not.
C: This option may bring projects into compliance, but you will displace mortality – who will be responsible for taking care of that mortality – ERP/EWA? Can we trust others to do this?

Do we have the right location(s) for intake:
C: We should look at other locations and options - one that is away from the killing field of the SD)
C: Article 7 of the Four Pumps Agreement states that we can look farther afield but we have not to date.
Q: What is the boundary for the intakes?
S: We should entertain an idea of decentralized elements of the intake system. A set of intakes apart from each other with no bypasses and no handling – lessor killing field
C: Location should be a DEFT responsibility. Consider each species and the effects of decentralized intake system. In-Delta storage option may diffuse this argument.
C: DEFT made some assumptions that affected our charge. We lost some options for other alternatives. Need scope of our assignment.
C: DEFT recommended a dual facility – Policy made decision with Interior and Governor.
C: We need input on this subject soon.
C: The 2500-cfs module with bypass is our charge.
Q: Can we consider multiple intakes within our present charge? How far can we go?

Other issues:
- Gulping versus sipping
- Lift and screen, or screen and lift
- Target species, life stages, and sizes
- Performance goals 95%?
- Solving problems away from intakes (e.g., debris removal)
- Are we constrained by the 2500 module? We can consider implications of expanding to full size.
- What is the level of design detail needed? How much detail is needed?
- Dealing with debris.
- Other info needs – can this group open line to other CALFED groups?
- Stranded cost – is it an issue? Do we build portable-salvageable facilities.
- How flexible do we make the 2500-cfs module.
- Level of monitoring needed to evaluate facility.

"The answers to issues may constrain the range of components evaluated."

Agreement:
Agreed to define assumptions and constraints, and limitations.
Agreed to define what we have to protect.
Agreed to make assumptions and communicate them to our management.
Risks we have identified puts some of these things on the table.
Agreed to define our mandate and potential for success.

TTAT Agreements

Went through TTAT agreements. Some are not applicable to CCFFF. Others can be adopted with limited change.
C: We are going to design something that is conservative – we can always draw back from that.

Treadmill Studies at UC Davis

Treadmill is wedge-wire, positive-barrier fish screen with 3/32-in mesh. Oval is about 74 inches in diameter. Water is diverted through inner screen to center of oval. Outer screen confines fish. Screens are about 16 inches apart. Combinations of approach (0-0.5fps) and sweeping velocities (0-2fps) were studied. Temperature and day-night were included as factors in the design. Tracked movement vectors of individual fish. Monitored tail contact and body contacts. Measured 48-hr latent mortality. Impingement defined as contact greater than 5 min. Performance variables analyzed included contact rate, impingement

rate, and latent mortality-survival. Behavior variable analyzed included location, velocity (of individual fish), rheotaxis.

Can't draw conclusions yet – report in October - some observations offered:

- Fish respond to resultant vector of the approach velocity and the sweeping velocity.
- Present smelt criteria are based on experiments on American shad in old test facility.
- Sweeping velocity increase reduces contacts.
- Contacts occurred early in exposure; fewer the longer fish were exposed.
- Changes in flow triggered behavioral changes
- More contacts a night and more contacts at night with 0.2 than 0.3 fps approach velocity.
- Higher the contact rates the lower the injuries.
- Higher sweeping velocity – higher rate of impingement
- Contact distance increases with approach velocity
- Impact velocity related to total velocity
- Impingement related to impact velocity
- Swimming velocity not related to sweeping velocity
- Sweeping flows move fish downstream at night but less so in day.
- Turbidity acts as darkness – increases contacts
- Splittail: were never impinged, survival high in all tests - sensitive to sweeping velocity and night approach velocity – contacts declined with higher sweeping velocity, increased at night
- Smelt: contact increased with time of exposure (fatigue); impingement (death) increased when approach velocity increased from 0.2 to 0.5 fps – none at 0.22, some at 0.33., day low mortality at 0.33, worse at night – contact rate related to death rate – sensitive to every factor
- Smelt were pumped successfully at Tracy.

Q: Were 1-fps sweeping velocities better with all approach velocities? R: Maybe.
Q: Was distance between the inner and outer screen varied/evaluated? R: No.

Discussion

C: Distance from CCF we can consider for intake location would be imaginary line from Byron-Victoria-Coney Island tracts – not above Highway 4.
C: Start working on design concepts for best first cut.
C: Define work needs first.
C: There are several alternatives and opt ions.
C: Fish lift is viable alternative – either before or after screen.
S: Make some assumptions and start designing around it.

Debris:
C: Debris can be prescreened at bar rack or kept out with floating retainer.
C: Various areas need debris control.
S: Start with a first stage gross debris separation.
C: Predators and small fish associate with debris.
S: Suggest a conveyor system for debris – variable speed depending on debris or other factors.
S: Suggest a sloping trash rake as primary trash manager.
C: Data needs: how much debris we need to handle by season; what fish associated with debris.
C: Surging backflush would not be advisable.
C: Need a continuous screen cleaner.
S: Concentrate debris with sloping rack.
S: Add leaky louver to debris solution.
S: Suggest a log boom or curtain wall to shunt debris to a recovery system.
C: A traveling screen would work for debris removal if in the upper water column. Need data on debris depth.
S: We should provide an opportunity for fish to separate from the debris.

Predator Management:
C: Need a UC Davis exclusion study using mechanical crowders.
Q: Are we concerned with injuring predators? R: We are not trying to remove striped bass from the Delta, just exclude them from immediate area of intake system.
C: Even with a 2500-cfs module, we will still have predator problems in CCF.
C: Near-field predator concerns – screen system and area around screen that is influenced by screen system.
S: Need to minimize predator areas around system components.
S: Separate fish by size to minimize predation in collection, holding, and transport systems.

Mitten Crabs:
- 2-in bar racks pass them
- louvers separate them successfully

S: Use finer, narrower racks to keep debris, crabs, and larger fish out of system.
C: Guidance walls and traveling screens are being tested at Tracy – info coming soon.
C: Solution is to guide and convey them out of fish facility systems.
C: *Concerned about juvenile fish in this removal system.*
S: Try K-rails and travelling screens.

Screens:
S: Consider co-angle screens.
C: White River screen – vertical with brush and high-pressure horizontal wash.
C: Cylinder screen – a hydraulic nightmare
C: *Campbell Station – 1200 cfs – needed flushing flow*
S: Drop cylinder screen from consideration.
S: Drop MIS screens as primary – could be secondary
S: Drop rotary drum screens – too mechanical – could be secondary.

Bypass:
C: Open bypass is better than a ramped bypass – use variable speed bypass pumps to control flow instead of ramp.
C: GCID is articulated overflow weir – get experience from GCID and White River on bypass design – look at GCID design.
C: GCID bypass does not lose much head.
C: Concern about bringing in new unknowns.
C: Variable speed pump could control tidal effect.
C: Tracy is the place to test these features.
S: Keep bypass open with a good velocity gradient – gradient is key.
C: We don't have to dewater in the bypass – why assume that function here?
C: Information like this should be obtained at Tracy.

Separator:
Q: Are we trying to separate species or larger predators? R: Both.
S: Keep fish larger than 4 inches out at head of bypass with leaky louver. Small fish will pass through to be handled by secondary screen system.
C: Small fish will also go with large fish to holding facility. They will be subject to predation in front of leaky louvers and in holding facility for big fish.
S: Alternative would be to try to separate small fish first.
C: These are problems for Tracy test facility to work out.
C: Continuous system may not have a predation problem.
C: Leaky louver with mechanical wet separator should be tested a Tracy.
C: No bypass with no-handling looks better all the time.
S: Should test various bypass channel configurations. Use flume to test various systems at Tracy.
C: Need to separate predators from prey.
C: Some predators are small – e.g. 100 mm striped bass.
Q: Can we separate species? R: No.
C: In the live box separator little fish have to make it through the big fish first – not good.

C: Leaky louver is best option before the screen.
C: Mechanical wet separator could take small fish first.
Q: Are we considering a traveling screen with crowder to separate fish?
S: Can we consider electrofishing predators before separator? R: No.

Holding and Fish Lift:
C: Most of these concepts will be below sea level.
C: Above ground holding will require cover and air conditioning.
C: Above ground is easier to deal with. Study at Tracy.
Q: Do we pump before bypass separator or after? R: Debris problem if before. Could have initial debris removal system prior to pumping to separator system.
Q: Pump all water or just water to bypass? R: just bypass water.
C: Should keep all items, but look at some on the side.
S: Lay out pump first option as well as pump at end option.

Wrap Up Comments:
1) We should prepare lists of information needs, fatal flaws, techniques, study plan and schedule.
2) Should take these elements and bundle into 3 or 4 fundamental approaches – help TATs and those preparing EA for SD Program.
3) Should start drawing up facilities – who does what.
4) Need to know what is going on at Tracy.
5) Need a schedule for gearing up DWR for CCFFF.
6) Need basic stage and elevation data.
7) Need a pre-design study plan.
8) Need a paper on each component – criteria ranges
9) Design should be modified based on Tracy results.
10) Decide whether we have a pump or tidal facility.
11) Decide where we go from here.
12) Get from management: mission, goals, objectives, questions, issues
13) From GCID experience – there is a danger with complex alternatives. Don't jump too fast to complex alternatives.
14) Label assumptions and don't lose them.
15) Start with a design memo.
16) Some components are more important because they have more need for improvement than screen component. Holding and trucking are important.
17) Team is ready to start – build from TFTF experience.
18) Cross-link design of the two facilities – DWR should be involved in TFTF design and visa-versa.
19) Favor simplicity
20) Need a commitment to get CCFFF design going.
21) Need to define performance goals – success criteria.
22) DWR fish team is going – two-year design program will fly by – We need to get started.
23) Challenge – go away and get some basic concepts down on paper – get CTAT going on this.
24) ID key issues by component from our meeting.
25) We did not address operational issues – gulping vs sipping.
26) The more we have the Tracy and CCF programs together the better.
27) We spent too much time on esoteric concepts like the PC in this workshop. R: Wasn't this part of our charge?
28) What is CTAT's task?
29) We should have coordinated CTAT and TTAT meetings.
30) A work plan is needed with scope and objectives.
31) Need papers by component and then bundles of components
32) Need to identify research needs. Should assemble interagency teams to do research.
33) Need a Tracy field trip.
34) Need a CTAT meeting in October.
35) Need gulp-sip modeling
36) Need a draft plan in a few weeks.
37) Matrix was helpful.

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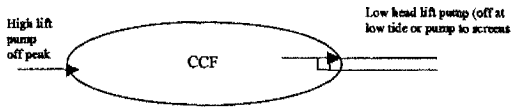
38) EIR should book end things.
39) Should have another workshop after first of the year.

Additional written comments:

40) Exposure time needs further discussion.
41) Justification for DFG's sweeping velocity of two times approach velocity.
42) How will conflicts among design criteria for various species be resolved, especially endangered species? Where do non-native fish fit in?
43) How to improve fish protection at diversion point given handling issue.
44) How much water do we have to divert during any year ~ "water tracking"
45) Concern that NMFS is not full partner in process.
46) Who is responsible for fish screen technical/engineering decisions at FWS for California?
47) We should look into fine tuning criteria by fish life stage.
48) We should reduce barriers for teamwork on tech problems.
49) If the south Delta area continues to be the bathtub drain of the Delta, is a decentralized screen system an option or must we "salvage"?
50) Will FWS use UC Davis studies as basis for revised screen criteria for delta smelt?
51) Can we have donuts next time.
52) Challenge to gain consensus from such a large group.
53) We should develop trap and truck techniques that are up to survival standards (> 95-99%)
54) There is still time to develop an isolated conveyance facility.
55) Is it wise to require criteria to be met when the life stage they are intended to protect are not present in significant numbers?
56) We should design for maximum operational flexibility in response to EWA and other actions.
57) What site-specific criteria do the agencies foresee for CCF?
58) The adherence to 0.2-fps approach velocity at all times limits operational flexibility.
59) Research, infrastructure needs and critical decision points should be put onto a GANTT schedule together with studies needed to develop solutions and facility components and modules.
60) Now that we are moving full speed ahead on S Delta screen facility, is it reasonable to keep consideration of isolated conveyance facilities alive in the process that has been set forth.



61. Issues: When to make 1-straw, 2 straw decision. Need to be sure of what potential impact will be to Delta fish; acceptability of combined salvage (trap and haul); whether or not a Peripheral Canal may be best for future operations, etc.
62. Issues: Ensure SWP maintains consistent environment.
63. Challenges: Debris removal, fish separation, and fish transportation and release.
64. Need discussion on fish screen cleaning criteria/development.
65. Debris concerns.
66. Criteria Issues: One project specific source book of all criteria must be developed. This runs to hydraulics, operations, evaluation, transport, etc.
67. Which design criteria will govern?
68. Will some agency have to compromise?
69. Consider using a great number of separately screened diversions using in channel drum type screens. This would allow the avoidance of handling.
70. The dead end slough issue can be handled by short suspensions of reductions in pumping and providing for pulse flows to move fish out. Anglers would help reduce predation.
71. What are the alternatives to "flow porosity" to equalizing (equalizing?) flow in front of screens?
72. These methods buy evenness at the sizable cost of head loss.
73. How soon can we establish the window of concern for the Delta Smelt (and American Shad) which requires 0.2fps.

74. This might allow flexibility of operation (to 0.33 fps)-which could become part of the "adaptive management" mix.
75. A decision on a "joint point of diversion" will be critical to the program. If we don't make a decision soon, we will have to either: 1) Design CCF siphon for full joint capacity- 2) Accept cost of going back to add capacity later.
76. TFTF: Need to organize the design development. Suggestion follows: 1) Identify issues--trash--bypass velocities--screen cleaning --etc. 2) Identify possible solutions. 3) Design facility to test the possible solutions.
77. What are the components and concepts that might be tested, what is the sequence, and how do they fit into the flume and/or bypass layout?
78. Gravity vs. pumped bypass--consider crossover of lines to put either leaky louver bypass flows or screen bypass flow into each type--louvers and screens will collect different species and sizes.
79. R: TFTF--experimental design issue: is you hold Q constant over tidal cycle, V will vary and evaluating effect of V on diversion and injury (screen contact) will be difficult. This should be considered; perhaps start with fixed Q's to evaluated effect of V as baseline, then let V vary and look for differences in system efficiency-
80. Will alternate types of fish separation/collection systems be considered? (Passive/Active Systems)
81. Flexibility of screen angle, various trash collectors and other items should be considered.... How fixed is configuration.
82. Monitoring of resident predators in the TFTF or predator control.
83. Will adjustments at Tracy PP occur to affect the pumping at TFTF.
84. Can the USGS presentation (graphs, charts, etc.) be copied and distributed to interested team members?
85. Are you aware of any existing fish screens close to the size being proposed?
86. What led USBR to favor the "leaky-louver" approach over the gravity bar-separator approach (such as used elsewhere with good success) for fish sorting?
87. Do you anticipate operations capability for operating screens at >0.2 fps when delta smelt and anadromous fish fry are not present?
88. Do you anticipate testing (further) a "pump-first-screen-second" approach?
89. Are you limiting yourselves to just--Wemco--Archimedes pumps w/out testing other pump types?
90. Does this team have the authority to build in "flexibility"? Example, can we build over-capacity for fish facilities or intake?
91. Pumping through screened diversion in Paradise Cut and then to Tom Paine Sl. as well as around the ORB will help the water elev. problem. That in turn will allow some slack in the CCFB filling rules.
92. Consider solving the water elev(?) problem on a real time basis rather than with fixed rules
93. Do very small fish like Delta Smelt travel at night (not day), and if so, why are we modeling them as particles adrift?
94. Do smelt orient with flow, against flow, not at all, or do we know?
95. Oroville: Will relicensing of Oroville result in changes to release amounts and timing from current and will these changes influence existing flows in the Delta?
96. Is it possible to enlarge Old River so that we can: 1) Take 15K @ CCF (NW location) w/out exceeding channel scour velocity or impacting water surface elevation @ low tides? 2) Convey an additional 5K to Tracy Intake and the same criteria as in 1?
97. Are there any data to indicate that "flow " or "velocity" are more important in the movement (active or passive) of fish in the S. Delta? These relationships have not been demonstrated at other water intakes (e.g., hydro projects, cooling water intakes.)
98. For flexibility in design, we need to think about what experiments are planned for multi-year biol. studies; these need to be identified if we are not to be looking back in 5 years and saying "Why didn't we think of this 5 years ago?"
99. The USGS hydrological data should be overlaid with SWP/CVP salvage date to help understand the relationships between hydrology, pumping, tides, and fish movements.
100. The team needs to analyze the "low-head, 24-hr pump inflow off-peak rate, high head, outflow" or 'Dump and Pump "scenario from an economic standpoint, among others.
101. What are the major components of the Total Fish Salvage process? What (questions about components) can be answered now, later, or in the future? Are there some questions such components of the salvage and transport process--which must be answered first?

102. How long can screens be if there is a 2 ft/sec sweeping velocity? NMFS states that they want < 60sec exposure time at 0.4 fps approach velocity (120' screens), but what can exposure time be a 0.2 ft/sec approach velocity? 120 seconds? That would make screen length 250'.
103. While it is comforting to do things as they have been done, it is not productive of new knowledge.
104. The group is now on the subject of why they were not allowed to provide their views to the "experts" in the DEFT team?
105. Prior to the next meeting we need 1) Scope of assignment in writing. I believe this is a 2500-cfs module, on the outside of CCF. 2) Clear set of objectives, --for species, --life stages, --allowable "impacts" on water surface elevation in South Delta, --ultimate size of project (250 X?), --allowable "impacts" on yield, power, costs. 3) Any other design criteria " and / or constraints.
106. I formally request that CALFED MANAGEMENT send to this committee a formal, written mission statement to: 1) Define the mission and goals of the project. 2) Identify the major commitments, opportunities, or constraints that the committee must satisfy or consider (including time frames). 3) Clearly state the geographical and hydraulic scope we are limited to in Phase I.
107. Stage I CALFED Mandate: Build the best fish salvage facility in the South Delta possible, with the provision that if it does not work--Adaptive Management will be used to effect appropriate changes.
108. Question: What will happen if research and development components indicate (early on) that we cannot produce satisfactory salvage efficiency; i.e.--what if we cannot substantially improve upon the <5% survival of Delta Smelt during the trucking? (this is only one of many concerns about the process)
109. I would like to have a presentation by the group that considers survival of fish after release back to the river.
110. Could we us a canal to transport fish back to Antioch?
111. Need topography of intake area.
112. Need water surface elevations: ranges 1) in river 2) in Clifton Court forebay 3) banks pumps (max. - min..)
113. What are the required levee elevations and requirements around the new intake?
114. Geology in area.
115. Seismic requirements.
116. Operational restrictions: Tidal, Day/night, Elevations, and Flows.
117. Define scope and objectives including limitations.
118. Get Panel Tracy info & review—re-look at objectives...
119. Schedule and study plan....
120. Identify data needs/collection and get started....
121. Scope out work.
122. White papers on "Ken's List"-- limits, how flexible they are (components). The expert panel; 0r/and TAT's could do this.
123. Develop "Straw Man" for next workshop?
124. Exchange program between DWR/USBR.
125. DWR/CALFED needs to get in Gear! 2 years will go by quickly...! Needs money, direction.

List of things the Workshop group thought ought to be tested at Tracy.

1. Test positive-barrier screen option with no fish bypass versus bypass with fish handling.
2. Test each component of fish handling process for mortality - focus on effectiveness of trucking on delta smelt.
3. Test different bypass flows.
4. Test effect of tide, mitten crabs, debris, etc.
5. Evaluate striped bass predation
6. Evaluate day vs night entrainment
7. Evaluate effects on different species and life stages
8. Evaluate effects of 0.2 vs. 0.33-fps approach velocity on salvage/impingement.
9. Evaluate effectiveness of fish guidance devices
10. Evaluate existing juvenile fish screening criteria for pump intakes
11. Test methods for debris handling
12. Evaluate the effectiveness and reliability of gravity vs. lift bypass - - need to test more gravity systems and effect of debris - test two types of lift pumps, maybe third.
13. Evaluate which is best: screen and lift or lift and screen.
14. Evaluate the effectiveness of secondary screening
15. Evaluate exposure time in all experiments
16. Develop predator management schemes
17. Develop means of sediment control within fish facility
18. Test two operating schemes – 1) let velocity float with tide or 2) fix velocity (variable speed pumps).
19. Test separating and loading facility limitations
20. Focus experiments on delta smelt and salmon
21. Develop a guidance systems for crabs
22. Evaluate the effectiveness of fish sorting
23. Evaluate O&M, constructability of new fish facilities.
24. Evaluate flow dynamics in fish facilities with UVM meters and ultrasonic velocity meters; side beam transducers
25. Evaluate whether difference in salvage between CCF and Tracy is based on hydrodynamics using flow dynamics data.
26. Evaluate effect of flow dynamics on salvage and potential FF operations - should include whether Delta is draining or filling (neap vs spring tidal effects)
27. Evaluate the influence on flow dynamics near and far field of pumping plants.
28. Evaluate role of wind and flow on salvage. Also effect of air pressure.
29. Compare hydrodynamics near two facilities under different operating conditions.
30. Evaluate role of San Joaquin flow and HOR barrier on Tracy entrainment and salvage.
31. Evaluate the effect of SD barrier operation on operations and entrainment/salvage, fish distribution and vulnerability to pumps.
32. Evaluate the effects of expanded Banks pumping on hydrodynamics, fish distribution, and entrainment/salvage, fish facility operations.
33. Consider variable speed drives to adjust approach velocity with tide change
34. Coordination between modelers and screen designers.
35. Experiment with low head pumps behind screens
36. Consider operations that optimize power costs given new deregulation of power system.
37. Test screens before or after lift pumps.
38. Optimizing design for sorting, handling, trucking, and fish return effects.
39. Study topography of area around TFF. Water surface elevations, geology, seismic, operational restrictions (tidal, day/night, elevations, flows)